INTEGRATING TECHNOLOGY AND PEDAGOGY IN UNDERGRADUATE TEACHER EDUCATION

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ABSTRACT

This reflection paper examines the uses and benefits of technology integration into a college course focused on teaching mathematics and provides the foundation for future research. Teacher education course work included technology that included augmentation, modification, and redefinition of learning tasks made possible through technological redesign and creation. Course assignments and classroom activities were enhanced by technological tools and applications to encourage collaborative work, student-centered learning environments, and problem-based learning. Student reflections are included to support observed benefits of integrated technology use during college level pre-service teacher education, and directions for future research are proposed.

KEYWORDS

Technology, Collaboration, Engagement, Student-Centered, Pedagogy

1. INTRODUCTION

The increasing use and applications of information and communication technology (ICT) have impacted the educational, social and work contexts in which we learn and live. The purpose of this paper is to highlight a range of ICT pedagogical practices that have been incorporated into college level mathematics methods education course work in ways that enhance engagement and understanding of mathematical concepts while also modeling technology-rich pedagogy for pre-service teachers.

2. CLASSROOM APPLICATIONS

The use of technology by teachers is motivating to their students and impacts their performance and attitudes. (Ladd & Dinella 2009). Students who are instructed with the use of technology obtain higher scores on mathematics post-tests and demonstrate positive attitudes regarding technology. (Eyyam & Yaratan 2014). The use of a range of technologies provided opportunities for college students to experience applications that could be integrated into elementary classrooms during field placements and future employment as teachers.

2.1 Problem-based, Collaborative, Student-centered Learning

Problem-based learning involves learning through the journey of finding solutions to real-world problems. During this process, students create and revise knowledge while utilizing and expanding their reasoning, communication, critical thinking, and synthesis of information. (Duch, et al. 2001). In this college course, students designed and constructed furnished scale models of “tiny” homes. Students were presented with the problem of designing a blueprint and constructing a scale model of a home measuring less than 350 square feet. This integrated learning project utilized technology in every stage, and involved integration of the mathematical concepts of proportion, ratio, measurement and geometry. Students posed individual design questions designed models that were creative and personally relevant. This technology infused project was integrative and involved research as well as application of a variety of mathematical concepts.

Another technology-infused project in this course involved collaborating in small groups to create online mathematics awareness newsletters to support and encourage parents. The rationale behind this task was that parents of elementary children might be frustrated or unable to help their children with mathematics homework as students are learning mathematics in ways that differ from their parents' learning. Ultimately each group collaborated to compile a family newsletter that included information, templates for making math manipulatives for home use, and online games targeting concept development and mathematical reasoning. The nature of this integrated task served not only practical purposes, but also resulted in a greater depth and breadth of learning as the college students addressed authentic issues in collaborative ways.

2.2 Student Engagement

During this course, each class session incorporated technology and engaged students in collaboration to solve problems and deepen understanding. Engagement and self-directed learning are likely to be enhanced by the integration of technology. (White & Robertson 2015). Below is a sampling of student reflections indicating engagement and learning:

- "My engagement was heightened by the opportunity to use technology and create my own understanding. I will remember the feeling of being truly engaged in an assignment, and the quality of knowledge constructed, and will work to create such an environment in my future classrooms."
- "The group process really helped me to listen and work together to come up with a viable solution and a simplified formula. I think that overall the group worked well together to problem solve, and further one another's ideas."

3. CONCLUSION

Utilizing technology can create dynamic collaboration opportunities as well as creative and problem-based learning. Students claim to be motivated and engaged during these class sessions, and research indicates that students' self-reports of engagement levels are the most valid measures of engagement. (Appleton et al. 2006). This reflection paper identifies that technology-rich pedagogy in teacher education programs can provide motivation and direction for designing research to examine the benefits of technology in this context. These observations have provided a sound basis to justify and design future research to study the impact of technology on student collaboration, problem-solving, motivation, and engagement. The relationship between technology, pedagogy and content is complex. (Harris, et al. 2009). How does technology impact pre-service teachers' motivation, engagement, and collaboration? In turn, how will this impact their teaching in their own classrooms? Technology-rich pedagogy in teacher education has the potential to impact not only these future teachers, but also their future students. Accordingly, future research is being planned to empirically examine these relationships and outcomes in more detail.

REFERENCES

Appleton, J. et al., 2006. Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology*, Vol. 44, No. 5, pp. 427-445.

Duch, B. J., et al., (Eds.), 2001. *The power of problem-based learning*. Sterling, VA: Stylus.

Eyyam, R., & Yaratan, H., 2014. Impact of use of technology in mathematics lessons on student achievement and attitudes. *Social Behavior and Personality*, Vol. 42, pp. 31-42.

Harris, J. et al, 2009. Teachers' Technological Pedagogical Content Knowledge and Learning Activity Types: Curriculum-based Technology Integration Reframed. *Journal of Research on Technology in Education*, Vol. 41, No. 4, pp. 393-416.

Ladd, G.W. & Dinella, L., 2009. Continuity and change in early school engagement: predictive of children's achievement trajectories from first to eighth grade. *Journal of Educational Psychology*, Vol.101, No. 1, pp. 190-206.

White, D. & Robertson, L., 2015. Implementing assistive technologies: a study on co-learning in the Canadian elementary school context. *Computers in Human Behavior*, Vol 51, pp. 1268-1275.